

ON SOME NEW SOUTH AUSTRALIAN COCCIDÆ.

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[Read July 3rd, 1888.]

PLATES XII. TO XIV.

The following paper contains detailed descriptions of some insects which Mr. F. S. Crawford, of Adelaide, has kindly sent to me. They are all, in various ways, interesting, and some of them are quite peculiar. It would be desirable that some systematic investigations should be made amongst the Australian Homoptera. This field has hitherto been very little worked, and, from these and other specimens which have come under my notice, I believe that a student of this very curious Order will find in Australia ample opportunities for most interesting work. All these insects have some peculiar features of their own well worth examination. If nobody in their native country cares to undertake the task, I shall be very happy to do what I can if specimens are sent to me.

On this I may mention, as a guide both to those who would like themselves to study Coccids and to those who might be good enough to send insects for identification, that two things are necessary. First, care must be taken to procure specimens, if possible, in all stages of existence; secondly, attention should be directed by a student to the determination of minute points of anatomy. The first is required because a Coccid, in very many cases, is quite different in different states of life; the female is quite unlike the male, the larva is often no guide whatever to the form of the adult. The second is requisite because, without minute examination, errors may very easily arise; for example, *Monophlebus Crawfordi*, herein described, in outward appearance very closely resembles, as to the female, *Celostoma Zealandicum*, and, as to the male, *Icerya Purchasi*. The minute rostrum of the female and the tassels of the male are distinguishing characters, to be made out only with a strong lens or the microscope. These remarks may perhaps seem to some superfluous, yet they contain points of the greatest importance for the study of Homoptera, especially Coccids.

FAMILY COCCIDIDÆ.

GROUP—DIASPIDINÆ.

Genus—*Aspidiotus*, *Bouché*.

Female puparium varying in colour, circular in outline, usually flat, sometimes rather convex ; pellicles central.

Male puparium elongated, not carinated ; pellicle at one end.

Aspidiotus eucalypti, sp. nov. Plate xii., fig. 1.

Female puparium (figs. 1 and *a* and *b*), circular, slightly convex, dirty-white in colour ; diameter averaging $\frac{1}{12}$ inch. The pellicles in the centre are very inconspicuous.

Male puparium (*c*) narrow, elongated, semi-cylindrical ; colour white, the pellicle yellow ; not carinated above. Length nearly $\frac{1}{8}$ inch.

Adult female (*d*) of the usual pegtop-shape of the genus, but with a deep transverse groove about one-third of the distance from the cephalic extremity, which divides it into two unequal portions. The other segments are not conspicuous. Colour dark brown. The abdomen is not overlapped by the anterior segments as in some species. Length, $\frac{1}{18}$ inch ; diameter almost the same. Abdomen (*e*) ending in two median lobes, and at each side some short fine hairs. No groups of spinnerets, but rows of spinnerets are arranged along the last three segments, and there are a few others scattered. After pressure, as shown in the figure, the pygidium is seen to extend for some distance within the edge of the abdomen, and is of a bright yellow.

Adult male not known.

The puparia of the females are found thickly aggregated in masses on the bark, with the males interspersed.

This species is clearly distinguished by the deep transverse groove on the female, as shown in figs. *b* and *d*. The male puparium is also narrower, and more cylindrical than usual.

Habitat.—On *Eucalyptus* (various kinds), South Australia ; often found intermingled with the next insect, *Chionaspis assimilis*.

Genus—*Chionaspis*, *Signoret*.

Female puparium usually, but not always, white ; elongated, generally nearly flat ; pellicles at one end.

Male puparium elongated, white, carinated ; pellicle at one end.

Chionaspis assimilis, sp. nov. Plate xii., fig. 2.

Female puparium (figs. 2 and *a* and *b*) elongated, pyriform, slightly curved, scarcely convex ; colour dark brown, the pellicles at one end yellow. Length, about $\frac{1}{10}$ inch.

Male puparium (*c*) brownish-white, narrow, semi-cylindrical; pellicle yellow. Length, $\frac{1}{16}$ inch.

Adult female (*d*) of the usual elongated form of the genus, the cephalic region smooth, the abdomen with conspicuous segments; colour brown. Length, about $\frac{1}{15}$ inch. The abdomen (*e*) ends in two median lobes with at each side a few spines; pygidium exhibiting five groups of spinnerets, but only two or three in each group.

The larva (*f*) is of the normal form of the Diaspid group, but the rostrum, as shown in the figure, appears to be abnormally large.

Habitat.—On Eucalyptus (various), South Australia.

This insect approaches very nearly *C. euonymi*, Comstock (Report of the Entomologist, U.S. Dept. of Agric., 1880, p. 313), especially in the small number of spinnerets in the groups; but it differs in colour in the lobes of the abdominal extremity, and in the absence of a "ventral scale" in the puparium.

GROUP—LECANIDINÆ.

SUBDIVISION—LECANIDÆ.

Genus—*Pulvinaria*, *Targioni*.

Female insects naked, arboreal, constructing a cottony ovisac: exhibiting an abdominal cleft and dorsal lobes at all stages. Male pupæ in cottony or waxy tests.

Pulvinaria flavicans, sp. nov. Plate xii., fig 3.

Adult female (figs. 3 and *a*), yellowish-brown in colour, not globular or gall-like, but slightly convex, rugose; outline sub-elliptical; naked, but producing a quantity of white cotton, which surrounds its edges, looking like a cushion on which the insect reposes; but on turning it over the ventral surface is seen to be bare, so that the insect rests rather on a ring of cotton. General form normal of the Lecanid group, exhibiting the abdominal cleft and dorsal lobes, but the cleft (*b*) is shallow and wide. Round the edge of the body is a row of spines, short and not very close together. Antennæ of apparently eight joints (*c*), but the division shown in the figure at *c* may be a "false joint," as in some other Lecanidæ, and the antenna may have really seven joints. Assuming eight as the number, all the joints are sub-equal in length, with a few short hairs; on the last joint is one hair about three times as long as the others. Feet (*d* and *e*) with somewhat thick femur, the tibia and tarsus slender; upper pair of digitules, with long, fine, knobbed hairs, lower pair rather longer than the claw, and slightly dilated at the tips. Anogenital ring (*f*) with many hairs. Rostrum short and thick:

mentum monomerous. On the ventral surface are many spinnerets, narrow projecting tubes, which are most numerous at the edges and near the posterior extremity.

Second stage of female not observed.

Larva (*g*) active; body elongated, very indistinctly segmented; colour brownish-yellow. Abdominal cleft and dorsal lobes present. The lobes are somewhat long, so that some larvæ seem almost to have anal tubercles; setæ long and thick. Antennæ (*h*) rather disproportionately large, with six joints, of which the third is the longest, the rest sub-equal; one or two short hairs on most of the joints, and one the last, which is fusiform, several hairs, of which one is very long, almost equal in length to the whole antenna. Feet also large and long, all the joints thick; the tibia is longer than the tarsus (an exceptional character in a larva); digitules, both upper and lower. Knobbed hairs. Anogenital ring (*i*) with eight hairs. A few short spines round the edge of the body.

Male in all stages unknown, but on the twig examined, amongst a number of females, there were a few empty, broken, glassy tests, of the usual form of *Lecanidæ*; these seem undoubtedly the tests of male pupæ.

This appears to be clearly a *Pulvinaria*, and differs in a few particulars from described species. The cottony ovisac is shorter and more ring-shaped than usual in the genus. But the species of *Pulvinaria* have not been diagnosed with sufficient completeness. *P. vitis*, Linn., *P. artemisiæ*, Licht., and *P. oxyacanthæ*, Linn., exhibit characters found in the South Australian insect.

GROUP—COCCIDINÆ.

SUBDIVISION—ACANTHOCOCCIDÆ.

Genus—*Eriococcus*, *Targioni-Tozzetti*.

Adult females enclosed in a sac of felted cotton; body elongated, segmented; anal tubercles conspicuous.

Amongst the characters hitherto ascribed to this genus are an elongation of the sac and a number of spines on the dorsum, and the sac is usually so clearly cottony as to present no difficulties. The insect about to be described is abnormal in both particulars, but other characters seem to place it in this genus—indeed, it agrees with no other—and it is therefore so allocated here. It presents several features of considerable interest.

Eriococcus paradoxus, sp. nov. Plate xiii., fig. 4.

Sac of adult female (figs. 4 and *a*) dark reddish brown, circular, convex, aggregated in masses on the bark, and so thickly covering it sometimes as probably to smother the plant; diameter about

$\frac{1}{8}$ inch. The aggregated mass is so thick that on cutting a vertical section it appears like a honeycomb of cells (*b*), each containing an insect. At the summit of the convex sac is a very minute orifice (not apparent in every instance). This orifice (shown in fig. *a*) is probably intended to give access to the male insect, specimens of which may sometimes be found inside the cellular sacs with the females. The sac is so closely fitted that it has quite the appearance of being waxy instead of cottony, but a little pressure with the point of a pencil makes an impression in it as if it were leathery; and on boiling in potash it becomes dissolved, which is not the case with any waxy coccid test, as far as I know. The spinnerets and threads described below are also evidences that the sac is really felted, though very closely.

The sac of the male (*c* and *d*) is reddish-yellow, narrow, elongated, convex above and flat beneath; after its last metamorphosis the male escapes by an orifice at one end.

Adult female (*e*) somewhat pegtop-shaped, the cephalic region large and smooth, the abdomen small, segmented and tapering to the two anal tubercles, which are prominent, and bear each a long seta. Colour dark reddish-brown; length, exclusive of the tubercles, about $\frac{1}{10}$ inch. On maceration and boiling in potash the anatomical details can be made out. On the cephalic region, as shown in the diagram (*f*), there are four bands of very small, circular spinneret orifices (shown enlarged in fig. *g*); these bands correspond with the position of the four stigmata of the body. On the abdominal segments there are rows of double, or figure-of-eight, spinnerets (fig. *h*, and enlarged fig. *i*); many of these also are scattered over the cephalic region. From these double spinnerets spring long white curling threads (*k*, *l*), which form the felted sac. The rostrum (*m*) is conical, and the mentum (*n*) is bi-articulate. The antennæ (*o*) are atrophied and very short; the number of joints cannot be clearly made out, owing to compression, which confuses them; but the normal number in the genus is six, and probably this is the case here also. The tip bears a few strong short hairs. The feet are entirely absent.

The second stage of the insect has not been observed.

The larva, just after leaving the egg, is of the normal shape of the genus (*p*)—elongated, flattish, tapering slightly posteriorly; exhibiting the anal tubercles. Colour reddish; length about one-fortieth of an inch. Antennæ (*q*) of six sub-equal joints, all slightly dilated at the end except the last, which is irregular and pointed, and bears some hairs; all the joints appear to be numerously ringed. Feet normal. On the body there are four longitudinal rows of figure of eight spinnerets (*r*). The anal tubercles bear long setæ.

♂ Adult male (*s*), red; somewhat short and squat; the thorax

broad, and the abdominal segments compressed. Length of the body, about one-fortieth of an inch. The last segment of the abdomen bears on each side three longish setæ. Antennæ (*t*) of ten joints, the first very short, the rest sub-equal, elliptical, except the second, which is dilated at the tip; all the joints bear hairs. Feet (*v*) slender; upper digitules long and slender, lower pair short; fine hairs. Abdominal spike (*w*) conical, pointed.

Habitat.—On *Pittosporum undulatum*. South Australia.

This is an anomalous and peculiar insect, and if the joints of the antennæ, in the adult female, have really more than six joints, as they may well have, it must be removed from the genus *Eriococcus*. The absence of the feet is also an abnormal character. In general outline the female resembles the New Zealand insect *Eriococcus hoheriae*, but in that the feet are present, though atrophied.

GROUP—COCCIDINÆ.

SUBDIVISION—DACTYLOPIDÆ.

Genus—*Ripersia*, *Signoret*.

Adult females stationary, excreting much white meal and cotton; antennæ of six joints; anogenital ring with six hairs; anal tubercles present but, in the adult, not conspicuous.

Ripersia leptospermi. sp. nov. Plate xiv., fig. 5.

Adult female flattish, a little raised and carinated on the dorsum; outline sub-circular, or if in a depression of the leaf proportionately compressed; colour dark purple, covered with white meal; producing rich red colour when immersed in potash. From the edge of the body radiate all round a large number of very long, fine, white, cottony, curling filaments which are also slightly arched, forming a kind of bower, under which is a mass of more granular cotton, slightly tinged with yellow, in which the eggs are laid and hatched. The filaments are in tufts set close together, and their average length is about twice the diameter of the insect. Antennæ (*a*) of six joints, of which the two first are very short, the last three sub-globular and sub-equal, and the third nearly half as long as the whole antenna; on the last joint are a few short conical bristles, on the third are two hairs, and one or two hairs on the rest. A "false joint" occurs on the third joint, as in some *Lecanidæ*. Feet (*b*) very long and slender; the tibia very little longer than the tarsus; claw slender; upper digitules long knobbed hairs, lower digitules short and very fine. Rostrum (*c*) short; mentum dimerous. The body has twelve inconspicuous segments, and at the edge is a row of twenty-four groups of large projecting tubular spinnerets with wide bases (two to each segment), from which spring the tufts of long, white, cottony

filaments (figs 1 and *d*). On the epidermis are other spinneret orifices, circular and not projecting, from which the yellower cottony mass is excreted. Anal tubercles inconspicuous with short setæ. Average diameter of the body, $\frac{1}{30}$ inch; average diameter from tip to tip of the cottony filaments, $\frac{1}{8}$ inch.

Second stage of the female not observed.

Larva just hatched (*e*) active, elongated, dark purple in colour, slightly dusted with white meal; body segmented; anal tubercles conspicuous, with long setæ. Antennæ (*f*) of probably four joints, but the joints are not easily distinguished. Feet thick, apparently normal. Length of body, about one-fiftieth of an inch.

Male in all stages unknown.

This insect is evidently a Dactylopid, from the character of the anal tubercles, the six-haired anogenital ring, and the general form of the adult female. It is referred to the genus *Ripersia*, on account of the six-jointed antennæ. Only one species of the genus appears to have been described hitherto (*R. corynepthori*, Signoret); but this seems to have nothing like the arched fringe of long white cottony filaments, and its colour is yellow. Other distinctions are in the form of the antennæ, the digitules of the foot, and the character of the spinnerets. The South Australian insect appears to be clearly distinct.

GROUP—COCCIDINÆ.

SUBDIVISION—MONOPHLEBIDÆ.

Hitherto a distinguishing character of this subdivision has been the possession of ten or eleven joints in the adult female. For this reason Signoret expressed doubts whether the specimens observed of the insect *Drosicha contrabens*, Walker (from Ceylon), which had only nine joints, were really adult females; and, having in view these doubts, I attached, in my "Scale Insects of New Zealand," the genus *Drosicha* with *Monophlebus*. It is quite clear, from the following account of a new species, that the subdivision must be extended as regards this character, and perhaps *Drosicha*, when again observed, may be found to be really as Walker originally described it.

Genus—*Monophlebus*, Leach.

Adult female with nine (or eleven?) joints in the antennæ; adult male with several long tassels on the abdominal segments.

A curious point about this is that, whilst all authors give generic characters for the females of *Monophlebus*, not one seems to have ever described, or perhaps observed, a female, at least so far as to determine its more minute features. Westwood and Leach possessed apparently specimens; and from their general

outward similarity to the females of *Porphyrophora*, *Guerinia*, &c., probably the eleven-jointed antennæ has been taken for granted. The males of several species of *Monophlebus* are described, chiefly as inhabiting the East Indies. In *Cælostoma*, an allied New Zealand genus, the antennæ have undoubtedly eleven joints; so also in *Icerya*. As far as I know, the following is the first published *detailed* description of a female *Monophlebus*, and it is interesting, as it necessitates the revision just noted of the characters of the genus.

Monophlebus Crawfordi, sp. nov. Plate xiv., fig. 6.

Adult female (figs. 1, *a* and *b*) brick-red in colour, with two broad longitudinal stripes of purple extending the whole length on the dorsal side and on the abdominal segments beneath. The body is slug-like, fat, and distinctly segmented with twelve divisions; somewhat convex above and flat beneath. The cephalic and thoracic region occupies half the length, so that the feet seem placed rather in a forward position, and the insect crawls slowly. There is a quantity of white, short, cotton covering the insect, and at gestation this is heaped in large masses containing the eggs. The antennæ (*c*) are tapering, with nine joints, the first and second are wider and shorter than the rest which are sub-equal except the last which is elongated oval; each joint bears some hairs. At the base of the antenna is situated the eye (shown in fig. *c*); this is small, tubercular, not faceted but with a central orifice or spot. The feet (*d*) are not very strong; the tibia is more than twice as long as the tarsus; the trochanter bears one long seta; all the joints have hairs, and on the under-side of the tibia is a series of short spiny hairs or bristles; the upper digitules appear to be absent, the lower pair being short, fine hairs. The rostrum is very minute, but may be clearly made out in a deep hollow between the anterior pair of feet (it is indicated in fig. *b*); it is conical (*e*) and appears to have no mentum. At the tip there are some short hairs, but no long setæ, as in most coccids. The body of the insect is covered with short, fine, spiny hairs, intermingled with small circular spinneret-orifices.

The second female stage has not been sent to me. Judging by analogy, this will probably be found (as in the allied New Zealand genus *Cælostoma*) to be encased in a large waxy test, and stationary on some plant. But, unless searched for by some one more or less familiar with the peculiar variations of coccids, which are generally not a little puzzling, it may not be found for some time; and analogy may be misleading, so that this second stage may really be something resembling the adult. It would be interesting to clear up the doubt, the metamorphoses of coccids being one of the most curious features of the family.

The adult male (*f*) is a fine insect, rather larger than usual amongst coccids, the body measuring almost $\frac{1}{9}$ inch and the expanded wings $\frac{2}{5}$ inch. It is not, at first sight, unlike the male of the allied genus *Icerya* (*I. Purchasi*, the cottony-cushion scale), having a red body and dark-brown wings. But the characteristic feature of the genus *Monophlebus* is the presence of a number of tassels on the abdomen—two on the last segment but one, and four on the last segment (*g*). In the figure one of the tassels is shown as cut off. The head, thorax, and abdomen are red, with darker patches; the thorax smooth, the abdomen cylindrical and segmented. On each segment are a few hairs, and each of the tassels bears several long setæ. The eyes are prominent, dark-brown, and conspicuously faceted. The wings are large, brown, with a strong red, bifurcated nervure, and two longitudinal whitish streaks or hyaline bands. The halteres are thick and inflated, with four seta-like hooks. Antennæ (*f* and *h*) long and rather stout, with ten joints, each of which is constricted in the middle, and may be easily mistaken for two. Each joint bears two rings of very long fine hairs. Feet (*i*) long and slender; the trochanter has a long seta; tibia more than twice the length of the tarsus; upper digitules absent, lower pair fine hairs. There are no ocelli on the head.

This is a very interesting insect for several reasons, the first of which may be that, as far as my information extends, the females of *Monophlebus*, as noted above, have not yet been described. The males of seven species are given in Dr. Signoret's work, the descriptions being taken verbatim from Westwood's "Arcana Entomologiæ," 1841; and nobody else seems to have examined or described the genus. Of these seven one (*M. Illigeri*) is given as from "Van Diemen;" in size it nearly agrees with our insect, the male being about $\frac{1}{8}$ inch long, with $\frac{2}{5}$ inch expansion of wings; but it [the male] is said to be "nigricans, pedibus nigris," and to have tassels on each abdominal segment. These old descriptions, especially in the absence of any notice of the females, are too vague for identification. Westwood assigns 22 joints to the antenna of the male *M. Illigeri*. He had evidently examined it only with a lens, and failed to see the constriction in each joint.

The female *M. Crawfordi* resembles very much in outward appearance the New Zealand insect *Celostoma Zealandicum*, and my friend Mr. Crawford sent it to me as of that genus. But the presence of a distinct rostrum, which can easily be seen although it is very small, quite removes it from *Celostoma*; and I have pleasure, whilst ascribing it to its proper genus, in connecting it with his name. Of proper habitat, it cannot well be said to have any, as it crawls about freely, though slowly. Probably, as stated above, the second female stage may be some day found to be stationary on some plant in waxy tests.

I should observe that, if the characters of *Monophlebus* hitherto given were correct, the insects above described, having only nine joints in the female antenna, could not be adult. But, in the first place, the whole appearance of the female, its free locomotion, its cottony envelope, its general form, all point clearly to its adult state. Secondly, and this is most important, the tibia is a great deal longer than the tarsus: and this, all through the Coccid family, with the exception of a very few genera, is only the case in the adult. I should be very much surprised if the female I have been describing ever turns out to be anything but full-grown.

PARASITES.

Coccids are greatly subject to attacks from parasitic enemies, chiefly Hymenoptera, sometimes Diptera. If it were not so, their ravages, which are quite bad enough as it is, would be entirely destructive; the parasites keep them very much in check. Amongst the insects described in this paper two clearly show parasites. I found five dead female *Aspid. eucalypti*, each containing the pupa-case of a hymenopterous parasite which had emerged and flown away; and Mr. Crawford has sent me four female *Monophlebus*, which are literally riddled like sieves with holes from which small dipterous flies have emerged. In New Zealand I have never yet found more than one parasite in a Coccid; these South Australian insects evidently can harbour many; I counted 69 holes in one *Monophlebus*. These flies appear to be of the same kind as that which Mr. Crawford has reported as killing *Icerya Purchasi*; but I am not sufficiently acquainted with the Diptera to identify them. The group Monophlebidæ (always excepting *Icerya*) are not, I think, injurious insects; and if they will breed numbers of parasitic flies which may also attack other and worse pests than they are, they might even be encouraged, if possible.

EXPLANATION OF PLATES XII. TO XIV.

PLATE XII.

Fig. 1. *Aspidiotus eucalypti*, sp. nov. Insects male and female in puparia on bark of eucalyptus; nat. size.

- a. Female puparia, upper side.
- b. Female puparium, underside with female.
- c. Male puparia, upper side.
- d. Adult female.
- e. Abdomen and pygidium of female with spinnerets.

Fig. 2. *Chionaspis assimilis*, sp. nov. Insects male and female in puparia on bark of eucalyptus; nat. size.

- a. Female puparium, upper side.
- b. Female, under side with female.
- c. Male puparia, upper side showing carination.
- d. Adult female.
- e. Abdomen and pygidium of do. with spinneret groups.
- f. Larva underside, showing rostrum.

Fig. 3. *Pulvinaria flavicans*, sp. nov. Females with cottony secretion on twig (shrub undetermined); nat. size.

- a. Diagram of adult female.
- b. Diagram of abdominal cleft and dorsal lobes of ditto.
- c. Antenna of ditto, showing doubtful joint at c.
- d. Foot of ditto.
- e. Claw and digitules of ditto.
- f. Anogenital ring of ditto.
- g. Larva.
- h. Antenna of ditto.
- i. Anogenital ring of ditto.

PLATE XIII.

Fig. 4. *Eriococcus paradoxus*, sp. nov. Insects male and female, in sacs on twig of *Pittosporum*; nat. size.

- a. Sacs of female, upper side, showing orifice.
- b. Vertical section of aggregated mass of sacs, with insects.
- c. Sac of male.
- d. Ditto, showing orifice of escape.
- e. Adult female.
- f. Ditto, diagram to show stigmatic spinnerets.
- g. Stigmatic spinnerets.
- h. Abdomen of female, showing tubercles and spinneret-bands.
- i. Abdominal spinnerets.
- k, l. Threads from ditto.
- m. Rostrum.
- n. Mentum with setæ.
- o. Antenna of female.
- p. Larva; dorsal view; diagram to show spinnerets.
- q. Antenna of ditto.
- r. Spinneret of ditto.
- s. Adult male.
- t. Antenna of ditto.
- v. Foot of male.
- w. Abdominal spike and setæ of ditto.

PLATE XIV.

Fig. 5. *Ripersia leptospermi*, sp. nov. Diagram of adult female after maceration and pressure; enlarged twelve diameters.

- a. Antenna of ditto.
- b. Foot of ditto.
- c. Rostrum of ditto.
- d. Spinnerets of ditto.
- e. Larva.
- f. Antenna of ditto.

Fig. 6. *Monophlebus Crawfordi*, sp. nov.

- a. Adult female, dorsal side, enlarged two diameters.
- b. Ditto, under side showing rostrum, enlarged two diameters.
- c. Antenna and eye of female.
- d. Foot of female.
- e. Rostrum of ditto.
- f. Adult male.
- g. Abdomen of male, showing tassels (one cut off).
- h. Three joints of antenna of ditto.
- i. Foot of male.

NOTE.—Mr. Maskell's drawings being in colours, the plates are photo-lithograph copies of them made by Mr. F. S. Crawford.